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EXAMINER HUNG, YUEB				
ART UNIT 2624		PAPER NUMBER		
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**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

Notice of the Office communication was sent electronically on above-indicated "Notification Date" to the following e-mail address(es):

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**Office Action Summary****Application No.**

10/064,620

**Applicant(s)**

MUKHOPADHYAY ET AL.

**Examiner**

YUBIN HUNG

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
**Period for Reply**

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

**Status**

- 1) ☒ Responsive to communication(s) filed on 17 November 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

**Disposition of Claims**

- 4) ☒ Claim(s) 1-8, 12-26, 31-33 and 35-38 is/are pending in the application.
- 4a) Of the above claim(s) \_\_\_\_\_ is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 1-8, 12-26, 31-33 and 35-38 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

**Application Papers**

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 20 December 2006 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
- Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
- Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

**Priority under 35 U.S.C. § 119**

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

**Attachment(s)**

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/08)  
Paper No(s)/Mail Date \_\_\_\_\_
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_

***Continued Examination Under 37 CFR 1.114***

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 11/17/08 has been entered.

***Response to Amendment/Arguments***

2. Claims 9-11, 27-30 and 34 have been canceled. Currently claims 1-8, 12-26, 31-33 and 35-38 are still pending.
3. In view of Johnson (US 4,228,353), the indication of allowable subject matter (regarding claims 14 and 32) have been withdrawn.
4. Applicant's arguments filed 08/18/08 have been fully considered and addressed below.

Regarding independent claim 1, and similarly independent claims 12, 15, 17, 20, 23, 24 and 31:

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- A. Applicant's argues that Tu selects portions, not frames (P. 10, 2<sup>nd</sup> paragraph). However, per paragraph 17 (especially lines 8-11) of the instant application, an image is a 2-D or 3-D distribution of pixels and a frame can be a snapshot of part of an image. Therefore the argument is not persuasive.
- B. Applicant's further argues that Nishihara only losslessly compresses an ROI and not the entire frame (P. 10, 3<sup>rd</sup> paragraph). However, as discussed above, an ROI is considered a frame. Therefore lossless compression is applied to a frame in this sense. Additionally, claim 1 recites "applying lossless compression to the at least one frame". Even if, for argument's sake, ROI is not the entire frame, applying lossless compression to the ROI is still applying it to the frame since an ROI is part of the frame. Finally, (lower) computation complexity (P. 10, 3<sup>rd</sup> paragraph, last two lines) is not a claim limitation. Therefore the argument is not persuasive.

***Claim Rejections - 35 USC § 101***

5. 35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the conditions and requirements of this title.

6. Claims 1-8, 12- 23, 32, 33 and 35-38 are rejected under 35 U.S.C. 101 as not falling within one of the four statutory categories of invention. Supreme

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Court precedent<sup>1</sup> and recent Federal Circuit decisions<sup>2</sup> indicate that a statutory "process" under 35 U.S.C. 101 must (1) be tied to another statutory category (such as a particular apparatus), or (2) transform underlying subject matter (such as an article or material) to a different state or thing. While the instant claim(s) recite a series of steps or acts to be performed, the claim(s) neither transform underlying subject matter nor positively tie to another statutory category that accomplishes the claimed method steps, and therefore do not qualify as a statutory process. (Note that while imaging devices such as MRI are mentioned or inherited in claims 12-22, they described the how the images are acquired but are not used in performing the functional steps of the claims. Regarding claim 32, the x ray angiogram device is mentioned in the preamble and therefore is not given weight; i.e., the recited method is not considered to be tied to the device.)

[Note: In preparing response to this Office action, Applicant is advised to consider the 08/15/08 Office memo available from:

[http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/section\\_101\\_05\\_15\\_2008.pdf](http://www.uspto.gov/web/offices/pac/dapp/opla/preognotice/section_101_05_15_2008.pdf)

or,

(from uspto.gov) click "Policy and Law", "Patents", "Memorandum to the Examining Corps", "Clarification of "processes" under ... 101".]

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<sup>1</sup> *Diamond v. Diehr*, 450 U.S. 175, 184 (1981); *Parker v. Flook*, 437 U.S. 584, 588 n.9 (1978); *Gottschalk v. Benson*, 409 U.S. 63, 70 (1972); *Cochrane v. Deener*, 94 U.S. 780, 787-88 (1876).

<sup>2</sup> *In re Bilski*, 88 USPQ2d 1385 (Fed. Cir. 2008).

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The USPTO "Interim Guidelines for Examination of Patent Applications for Patent Subject Matter Eligibility" (Official Gazette notice of 22 November 2005), Annex IV, reads as follows (see also MPEP 2106):

Descriptive material can be characterized as either "functional descriptive material" or "nonfunctional descriptive material." In this context, "functional descriptive material" consists of data structures and computer programs which impart functionality when employed as a computer component. (The definition of "data structure" is "a physical or logical relationship among data elements, designed to support specific data manipulation functions." The New IEEE Standard Dictionary of Electrical and Electronics Terms 308 (5th ed. 1993).)

"Nonfunctional descriptive material" includes but is not limited to music, literary works and a compilation or mere arrangement of data.

When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized. Compare *In re Lowry*, 32 F.3d 1579, 1583-84, 32 USPQ2d 1031, 1035 (Fed. Cir. 1994) (claim to data structure stored on a computer readable medium that increases computer efficiency held statutory) and *Warmerdam*, 33 F.3d at 1360-61, 31 USPQ2d at 1759 (claim to computer having a specific data structure stored in memory held statutory product-by-process claim) with *Warmerdam*, 33 F.3d at 1361, 31 USPQ2d at 1760 (claim to a data structure per se held nonstatutory).

In contrast, a claimed computer-readable medium encoded with a computer program is a computer element which defines structural and functional interrelationships between the computer program and the rest of the computer which permit the computer program's functionality to be realized, and is thus statutory. See *Lowry*, 32 F.3d at 1583-84, 32 USPQ2d at 1035.

7. Claim 31 is rejected under 35 U.S.C. 101 because the claimed invention is directed to non-statutory subject matter as follows. Claim 31 defines a computer program embodying functional descriptive material (i.e., a computer program or computer executable code). However, the claim defines a "machine-readable medium", which is not considered the same as a "computer-readable medium or computer-readable memory", and is thus non-statutory for that reason (i.e., "When functional descriptive material is recorded on some computer-readable medium it becomes structurally and functionally interrelated to the medium and will be statutory in most cases since use of technology permits the function of the descriptive material to be realized" – Guidelines Annex IV). The scope of the presently claimed invention encompasses products that are not necessarily

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computer readable, and thus NOT able to impart any functionality of the recited program. The examiner suggests amending the claim(s) to embody the program on "computer-readable medium" (per line 2-7 of paragraph 34 of the instant application); assuming the specification does NOT define the computer readable medium as a "signal", "carrier wave", or "transmission medium" which are deemed non-statutory (refer to "note" below). Any amendment to the claim should be commensurate with its corresponding disclosure.

[Note:

"A transitory, propagating signal ... is not a "process, machine, manufacture, or composition of matter." Those four categories define the explicit scope and reach of subject matter patentable under 35 U.S.C. § 101; thus, such a signal cannot be patentable subject matter." (*In re Nuijten*, 84 USPQ2d 1495 (Fed. Cir. 2007)). Should the full scope of the claim as properly read in light of the disclosure encompass non-statutory subject matter such as a "signal", the claim as a whole would be non-statutory. Should the applicant's specification define or exemplify the computer readable medium or memory (or whatever language applicant chooses to recite a computer readable medium equivalent) as statutory tangible products such as a hard drive, ROM, RAM, etc, **as well as** a non-statutory entity such as a "signal", "carrier wave", or "transmission medium", the examiner suggests amending the claim to include the disclosed tangible computer readable storage media, while at the same time excluding the intangible transitory media such as signals, carrier waves, etc.

Merely reciting functional descriptive material as residing on a “tangible” or other medium is not sufficient. If the scope of the claimed medium covers media other than “computer readable” media (e.g., “a tangible media”, a “machine-readable media”, etc.), the claim remains non-statutory. The full scope of the claimed media (regardless of what words applicant chooses) should not fall outside that of a computer readable medium.]

***Claim Rejections - 35 USC § 112***

8. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

9. Claim 23 is rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed, had possession of the claimed invention.

Specifically, claim 23 recites applying lossless compression and lossy compression to different portions and in a phone interview on 12/4/08 Applicant's representative Mr. Joseph Stecewycz indicated that support could be found in Fig. 1, ref. 130 and paragraph 31 of the instant application. However, paragraph



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16 of the application states that in 130 lossless compression is applied to the selected portion and paragraph 31 states that lossy compression is applied to the selected portion (for applications for which precision is not critical). Nowhere can support be found that lossless compression and lossy compression are applied to different portions of the same image sequence. Therefore the written description requirement has not been complied.

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10. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

11. Claims 12 and 13 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

12. Claim 12 recites the limitation "the at least one image" in lines 10-11.

There is insufficient antecedent basis for this limitation in the claim. [For examination purpose "the at least one image" will be interpreted as "the at least one frame".] Dependent claim 13 is similarly rejected.

### ***Claim Rejections - 35 USC § 103***

13. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

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(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

14. Claims 1-3, 5, 12, 13, 23-26 and 31 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy et al. (US 5,297,043) and Nishihara et al. (US 4,903,317).

15. Regarding claim 1, and similarly claims 12, 24 and 31, Tuy discloses

- providing a span of interest for an acquired image sequence, wherein the span of interest defines a time sequence and a space sequence in the acquired image sequence that includes analytically relevant information in the acquired image sequence  
[Fig. 1, refs. B (acquired image sequence), 20 & 32 (provides a span of interest as recited); Figs. 2 (acquired image sequence), 3A, 3B & 4; Col. 4, lines 66-68; Col. 5, lines 22-24; Col. 6, lines 23-25]
- selecting at least one frame of the acquired image sequence in the span of interest  
[See the analysis above. Note that the per paragraph 17, especially lines 9-11, of the instant application a frame is a snapshot of a part of an image]
- displaying at least one analytically relevant image, thereby displaying the analytically relevant information  
[Fig. 1, ref. C; Col. 5, lines 22-24]

Tuy does not expressly disclose that the selected frame(s) is losslessly compressed and decompressed.

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However, Nishihara discloses losslessly compressing and decompressing region of interest (ROI, considered as the frame as defined in the instant application) of image data. [Figs. 9 (compress) & 10 (decompress); Col. 8, lines 36-45; Col. 9, lines 30-53. Note that per paragraph 17 (especially lines 8-11) of the instant application, an image is a 2-D or 3-D distribution of pixels and a frame can be a snapshot of part of an image and therefore an ROI is considered as a frame.]

Tuy and Nishihara are combinable because they are from the same field of endeavor of selecting image portion.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify Tuy with the teaching of Nishihara by applying lossless compression to the selected portion (such as a frame). The reasons for doing so at least would have been to reduce the storage requirement while preserving the fidelity of the important portion, such as the diseased portion of medical images, as Nishihara indicates in Col. 8, lines 35-43.

Therefore, it would have been obvious to combine Nishihara with Tuy to obtain the invention as specified in claim 1.

16. Regarding claims 2, 3, and similarly claims 25 and 26, Tuy further discloses

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- (claims 2 & 26) wherein the at least one frame comprises a plurality of frames in time sequence  
[Fig. 3C]
- (claims 3 & 25) wherein the at least one frame comprises a plurality of frames in space sequence  
[Fig. 3C]

17. Regarding claim 5, the combined invention of Tuy and Nishihara further discloses

- wherein selecting the at least one frame in the acquired image sequence comprises using a user to select option for selecting the portion of image  
[Tuy: Fig. 1, ref. 32]

18. Regarding claim 13, Tuy further discloses

- wherein the imaging device is a medical imaging device selected from the group consisting of: a magnetic resonance imaging system, a computed tomography system, an x ray system, an x ray angiogram system and an ultrasound system  
[Fig. 1; ref. A and Col. 4, lines 21-27 (CT scanner or MRI)]

19. Regarding claim 23, Nishihara further discloses lossily compressing/decompressing a second region that is not the selected (first) portion (i.e., the ROI) [Fig. 9; Col. 8, lines 36-46].

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20. Claims 4 and 7 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043) and Nishihara (US 4,903,317) as applied to claims 1-3, 5, 12, 13, 23-26 and 31 above, and further in view of Scorse et al. (US 5,128,776).

21. Regarding claim 4, the combined invention of Tuy and Nishihara discloses all limitations of its parent, claim 1.

Scorese discloses the following limitation that is not expressly disclosed in the combined invention of Tuy and Nishihara:

- archiving the at least one analytically relevant image  
[Fig. 1, ref. 34, 38; Col. 4, lines 20-22]

The combined invention of Tuy and Nishihara is combinable with Scorese since they have aspects that are from the same field of endeavor of compression.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the combined invention of Tuy and Nishihara with the teaching of Scorese by archiving relevant image sequence. The reasons at least would have been to have important data preserved for later use or review.

Therefore, it would have been obvious to combine Scorese with Tuy and Nishihara to obtain the invention as specified in claim 4.

22. Regarding claim 7, the combined invention of Tuy and Nishihara discloses all limitations of its parent, claim 5. In addition, Scorese further discloses

- wherein the user select option comprises manually marking frames of interest  
[Fig. 1, ref. 18; Col. 4, lines 35-37]

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23. Claims 6 and 8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043) and Nishihara (US 4,903,317) as applied to claims 1-3, 5, 12, 13, 23-26 and 31 above, and further in view of Ransford et al. (EP 479,563 A2).

24. Regarding claim 6, the combined invention of Tuy and Nishihara discloses all limitations of its parent, claim 5.

The combined invention of Tuy and Nishihara does not expressly disclose the following, which is taught by Ransford:

- wherein the user select option comprises segmenting an identifiable anatomy of a patient  
[Col. 11, lines 28-32]

The combined invention of Tuy and Nishihara is combinable with Ransford since they have aspects that are from the same field of endeavor of medical image processing (specifically, X-ray and ultrasound images).

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the combined invention of Tuy and Nishihara with the teaching of Ransford as recited above. The reasons at least would have been to locate

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the part (e.g., thorax) of a patient that is of interest, as Ransford indicates in Col.

11, lines 29-31.

Therefore, it would have been obvious to combine Ransford with Tuy and Nishihara to obtain the invention as specified in claim 6.

25. Regarding claim 8, Ransford further discloses

- wherein the user select option comprises sketch-gripping an image boundary  
[Col. 11, lines 28-32]

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26. Claim 14 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043) and Nishihara (US 4,903,317), and further in view of Johnson (US 4,228,353).

27. Regarding claim 14, first note that Tuy discloses using X-ray imaging to acquire images [Fig. 1, ref. 14; Col. 4, lines 21-34]. Moreover, per the analysis of claim 1 the combined invention of Tuy and Nishihara discloses

- providing a span of interest for the images obtained by the x ray device, wherein the span of interest defines a time sequence and a space sequence that includes analytically relevant information in the images and excludes other information in the images

- selecting at least one frame of interest in the span of interest, thereby selecting the analytically relevant information and sacrificing the other information
- applying lossless compression to the at least one frame of interest and obtaining therefrom a compressed image sequence
- applying decompression to the compressed image sequence and obtaining therefrom an analytically relevant image sequence
- displaying the analytically relevant image sequence, thereby displaying the analytically relevant information without displaying the other information

The combined invention of Tuy and Nishihara does not expressly disclose the following, which is taught by Johnson:

- wherein the space sequence is defined by a collimator ring  
[Refs. 114-118 (especially 116) of Figs. 6 & 7; Col. 15, line 51-Col. 16, line 63 (especially lines 51-54 of Col. 15)]

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the combined invention of Tuy and Nishihara with the teaching of Johnson to obtain the invention as specified in claim 14. The reasons at least would have been because the collimator ring determines the signal read by the detectors and therefore determines region with meaningful information, as Johnson indicates in Col. 15, line 51-Col. 16, line 6 and Col. 16, lines 42-52.



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28. Claims 15 and 16 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043) and Nishihara (US 4,903,317) as applied to claims 1-3, 5, 12, 13, 23-26 and 31 above, and further in view of Sutherland et al. (USPUB 2005/0277823 A1).

29. Regarding claim 15, per the analysis of claim 1 the combined invention of Tuy and Nishihara disclose

- providing a span of interest for the images obtained by (an imaging device), wherein the span of interest defines a plurality of frames in a time sequence between two time instances that includes analytically relevant information in the acquired image sequence
- applying lossless compression to the plurality of frames of interest and obtaining therefrom a compressed image sequence
- applying decompression to the compressed image sequence and obtaining therefrom an analytically relevant image sequence
- displaying the analytically relevant image sequence

The combined invention of Tuy and Nishihara does not expressly disclose that the frames are obtained from an x-ray angiogram.

However, Sutherland discloses capturing x-ray angiograms (as image frames) and comparing a series of angiograms over a time period (i.e., between two time instances) for diagnostic purpose [Figs. 6A-6C, 7A, 9A, 9B; Abstract; Paragraphs 3, 12, 41-45, 56, 69, 70].

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The combined invention of Tuy and Nishihara is combinable with Sutherland since they have aspects that are from the same field of endeavor of image acquisition.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the combined invention of Tuy and Nishihara with the teaching of Sutherland by using x-ray angiograms over a time period (for diagnostic purpose). The reasons at least would have been to be able to track vascular intervention site, as Sutherland indicates in paragraph 12.

Therefore, it would have been obvious to combine Sutherland with Tuy and Nishihara to obtain the invention as specified in claim 15.

30. Regarding claim 16, Sutherland further teaches/suggests a span for analysis as the span when the dye is present, i.e., begins when the dye appears and ends when it disappears [Paragraph 3, last 3 lines].

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31. Claims 17 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043) and Nishihara (US 4,903,317), and further in view of Chui et al. (US 5,841,473).

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32. Per the analysis of claim 15, the combined invention of Tuy and Nishihara discloses all limitations of claim 17 except for the imaging device, which is an MRI for claim 17.

However, Chui discloses compressing MRI image sequences [Col. 6, lines 36-44].

The combined invention of Tuy and Nishihara is combinable with Chui since they have aspects that are from the same field of endeavor of image compression.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the combined invention of Tuy and Nishihara with the teaching of Chui by compressing MRI image sequences. The reasons for doing so at least would have been because such images are frequently acquired in medical procedures and the reduction of their size (by compression) can save the storage cost.

Therefore, it would have been obvious to combine Chui with Tuy and Nishihara to obtain the invention as specified in claim 17.

33. Regarding claim 18, note that Tuy discloses a plurality of frames in a space sequence [Fig. 3C]

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34. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043) and Nishihara (US 4,903,317) and Chui et al. (US 5,841,473) as applied to claims 17 and 18 above, and further in view of Reinsch (US 5,134,661).

Regarding claim 19, the combined invention of Tuy, Nishihara and Chui discloses all limitations of its parent, claim 17.

The combined invention of Tuy, Nishihara and Chui does not expressly disclose that the frames are automatically selected using edge detection.

However, Reinsch suggests using edge detection to select areas of interest. [Abstract: lines 1-9. Note that per paragraph 17 of the instant application, an image is a 2-D or 3-D distribution of pixels and a frame can be a snapshot of part of an image (such as an area of interest).]

The combined invention of Tuy, Nishihara and Chui is combinable with Reinsch since they have aspects that are from the same field of endeavor of image processing.

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the combined invention of Tuy, Nishihara and Chui with the

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teaching of Reinsch by using edge detection to select areas of interest. The motivation would have been because edge detection produces edge points that can be processed to obtain the contours of regions of interest.

Therefore, it would have been obvious to combine Reinsch with Tuy, Nishihara and Chui to obtain the invention as specified in claim 19.

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35. Claims 20-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy et al. (US 5,297,043), Nishihara et al. (US 4,903,317) and Okazaki (US 5,311,869).

36. Regarding claim 20, per the analysis of claim 1 the combined invention of Tuy and Nishihara discloses

- providing a span of interest for the images obtained by (an imaging device), wherein the span of interest defines at least one frame in a time sequence and a space sequence
- applying lossless compression to the at least one frame of interest and obtaining therefrom a compressed image sequence
- applying decompression to the compressed image sequence and obtaining therefrom an analytically relevant image sequence
- displaying the analytically relevant image sequence

The combined invention of Tuy and Nishihara does not expressly disclose that the imaging device is an ultrasound device.

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However, Okazaki discloses using an ultrasound device to acquire image data.

[Abstract; Fig. 4, especially ref. 16 (ultrasonic wave transducer); Col. 6, lines 8-34.]

At the time of the invention, it would have been obvious to one of ordinary skill in the art to modify the combined invention of Tuy and Nishihara with the teaching of Okazaki to obtain the invention as specified in claim 20. The reasons for doing so at least would have been to be able to acquire images for display as part of a medical treatment process (as Okazaki indicates in the abstract as well as Col. 8, lines 8-64). Note that it is well known that ultrasound device does not expose patients or medical personnel to radiation. [For example, see Col. 2, lines 18-26 of Zanelli (US 6,515,657)—not relied upon in this rejection but was cited in the 06/16/08-mailed Office action.]

Regarding claims 21 and 22, the combined invention of Tuy, Nishihara and Okazaki discloses all limitations of its parent claim 20. Additionally, Nishihara also discloses automatic selection (teaching for claim 21) of region of interest [Fig. 9, ref. 68 and Col. 8, lines 36-59] and Tuy discloses manual selection (teaching for claim 22) of ROI [Fig. 1 (especially refs. 20, 32 and C); Col. 5, lines 22-46]. Further, Okazaki also discloses the acquired images are fan-shaped. [See ref. 42 in Figs. 1, 4, 8(A) and 8(B); Col. 1, lines 31-34 & 49-51; Col. 8, lines 8-64. Note that the fan-shaped images are considered as ROI.]

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37. Claims 32, 33 and 36-38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043), Nishihara (US 4,903,317) and Johnson (US 4,228,353) (as applied to claim 14 above), and further in view of Sutherland et al. (USPUB 2005/0277823 A1).

38. Regarding claim 32, per the analysis of claim 14 the combined invention of Tuy, Nishihara and Johnson discloses all of its limitation except for the limitation that the time sequence is based on a dye, which is taught by Sutherland, as per the analysis of claim 15.

39. Regarding claim 33, per the analysis of claim 16 Sutherland further teaches/suggests a span for analysis as the span when the dye is present, i.e., begins when the dye appears and ends when it disappears [Paragraph 3, last 3 lines].

Note that the reasons to combine the references have already been provided in the analyses of claims 1, 14 and 15 above.

40. Regarding claim 36, per the analysis of claim 33 the acquired image sequence is confined within a predetermined time-space portion.

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41. Regarding claims 37 and 38, note that the combined invention discloses selecting a portion (i.e., a certain ratio A of the total) of the image sequence and applying compression to the selected portion (and therefore reducing the size by a certain ratio B).

At the time of the invention, it would have been obvious to a person of ordinary skill in the art to apply the ratio ranges recited in claims 37 and 38, respectively). Applicant has not disclosed that the recited ranges provide an advantage, are used for a particular purpose or solve a stated problem. One of ordinary skill in the art, furthermore, would have expected Applicant's invention to perform equally well with either ratios A and B taught by the combined invention or the ranges recited in claims 37 and 38, respectively because both perform the same function of reducing the size of a selected portion of an image sequence.

Therefore, it would have been obvious to one of ordinary skill in this art to modify the combined invention with the recited ranges to obtain the inventions as specified in claims 37 and 38, respectively.

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42. Claim 35 is rejected under 35 U.S.C. 103(a) as being unpatentable over Tuy (US 5,297,043), Nishihara (US 4,903,317), Johnson (US 4,228,353) and Sutherland et al. (USPUB 2005/0277823 A1) as applied to claims 32, 33 and 36-38 above), and further in view of Matsugu et al. (US 6,167,167).



43. Regarding claim 33, the combined invention of Tuy, Nishihara, Johnson and Sutherland discloses all limitation of its parent claim 32.

The combined invention does not disclose the use of a binary mask, which is taught by Matsugu [Figs. 1 & 2; Col. 10, lines 21-67, especially lines 58-62].

Therefore it would have been obvious to modify the combined invention with the teachings of Matsugu to obtain the invention of claim 35. The reasons for doing so would at least because only an image of the subject region alone is extracted and therefore reduce the size of the data, as Matsugu indicates in Col. 10, lines 58-62.

### ***Conclusion and Contact Information***

44. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure:

- Christopoulos et al. ("Efficient region of interest coding techniques in the upcoming JPEG2000 still image coding standard", IEEE International Conference on Image Processing, September 2000, pp.41-44)
- De Bonnet (US 6,535,642) – discloses compressing entire MRI frames
- Khun (US 5,982,916) – discloses using masks to detect ROI
- Anderson et al. (US 4,274,422) – discloses fan-shaped ultrasonic images

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45. Any inquiry concerning this communication or earlier communications from the examiner should be directed to YUBIN HUNG whose telephone number is (571)272-7451. The examiner can normally be reached on 7:30 - 4:00. If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Bhavesh M. Mehta can be reached on (571) 272-7453. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

46. Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Yubin Hung/  
Primary Examiner, Art Unit 2624